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Memorandum

To: **LaDonna Turner, Site Assessment Manager**
Technical and Enforcement Branch
U.S. Environmental Protection Agency, Region 6

From: **Dana Bahar, Manager, Superfund Oversight Section,**
Ground Water Quality Bureau, New Mexico Environment Department

Date: **March 31, 2011**

Subject: **Pre-CERCLIS Screening Assessment of Sandstone Mine, New Mexico:**
Further Action Under CERLCA Recommended

Site name	Sandstone Mine	**Street address**	NA		
City	NA	**State**	New Mexico	**Zip code**	NA
County	McKinley County				
Latitude	35°23' 47.23"	**Longitude**	107°45' 38.91"		

Site physical description:
The Sandstone mine (Site) is located approximately 3 miles north/northeast of the junction of State highways 509 and 605 (Figure 1). The Site was reclaimed by the United Nuclear Corporation (UNC). In the 1980s the headframe was removed from the Site. In 1994 all the buildings and other improvements were removed. All the ore and waste rock was removed or buried on-site. Access to the 8 acre site is limited by a barbed-wire fence and gate (Ref 1). The New Mexico Energy, Minerals and Natural Resources Department (NMEMNRD) released the Site in 1999 from further requirements of the New Mexico Mining Act (Ref 2).

Site identification:
The Site is one of approximately 97 identified legacy uranium mines within the Ambrosia Lake mining district of the Grants Mineral Belt (Ref 3).

Site summary:
A vertical shaft was sunk to a depth of 940 feet below the surface in 1958 in order to access an uranium deposit below the water table within the Westwater Canyon member of the Morrison Formation. Phillips Petroleum and UNC operated the Site from 1959 to 1980 when mining activities ceased. The Site prior to 1971 produced 1,034,255 tons of uranium ore that averaged 0.17 per cent uranium oxide (Ref 4).

The Site was considered a wet mine with the ore zone below the water table. In 1978, the estimated mine dewatering discharge from the Site was 0.51 million gallons per day (Ref 5). The Site along with two other UNC mines in the Ambrosia Lake area discharge mine water to a pond near the ion exchange facility

located by the old Phillips mill site. This water was then run through the ion exchange for uranium recovery. Most of this water was then recirculated back to the mines to further leach uranium. In 1977, a discharge was observed to an arroyo near the ion exchange facility (Ref 6). In 1975, the ion exchange effluent was sampled. Analysis showed the effluent averaged 31 picocuries per liter (piC/L) radium 226, 0.08 milligrams per liter (mg/L) selenium and 7.8 mg/L uranium which are all above New Mexico Water Quality Control Commissions ground water standards (Ref 7). It is also believed that some backfilling of the Site with tailings may have occurred during its operation (Ref 6).

Reclamation of the Site was conducted primarily in 1994 by UNC. The Site being an "existing mining operation" under the New Mexico Mining Act (NMMA), UNC requested release from further requirements from the NMMA. Reclamation of the Site included the removal of all buildings and other improvements. All mine shafts and vent holes were permanently sealed with a 4 foot thick reinforced concrete cap. All residual ore or waste rock was removed or buried. All disturbed areas have been covered with at least one foot of soil and revegetated (Ref. 1). After several site inspections, further debris removal and reseeding of the Site, NMEMNRD released UNC in 1999 from further requirements of the New Mexico Mining Act (Ref. 2). No ground water investigation was conducted as part of the reclamation activities nor did the Site operate or close under a NMED Ground Water Discharge Plan.

Targets:
Wells that are registered with the New Mexico Office of the State Engineer (OSE) and located within a 4-mile radius are shown in Table 1. The Site is within the 4 mile radius of the junction of State highway 509 and 605 which includes a small community, and residences, that rely on private and domestic wells (Ref 8). Table 2, identifies domestic wells that were sampled by NMED in 2009. Results show ground water concentrations exceeding the Environmental Protection Agency (EPA) Maximum Contaminant Levels (MCL) and the New Mexico Water Quality Control commissions (NMWQCC) ground water standards.

No assessment was conducted for surface and radioactivity hazards at the Site to determine if surface reclamation has been effective in the long-term elimination of such threats to human health and the environment. Voght tank, a surface water impoundment near the Site that was utilized for storage of mine dewatering is utilized by livestock and wildlife. No assessment of water quality has been conducted.

Site ownership and Potential Responsible Parties:
Phillips Petroleum operated the Site from 1959 to 1963. United Nuclear Corporation operated the Site from 1963 until 1980 when mining operations ceased (Ref 3). Effective as of March 31, 1988, United Nuclear released the mineral lease under which it conducted its activities. UNC's only remaining interest in this mine is its ownership of the surface. Hecla Mining Company is the owner of the mineral estate as they are the successor in interest of Ranchers Exploration, the company from which United Nuclear originally leased the mineral rights (Ref 9).

File review:
Files that were reviewed for this assessment are listed below.

Site reconnaissance:
The last documented Site Reconnaissance occurred in 1998 by NMEMNRD personnel (Ref. 2). NMED has not conducted a site reconnaissance.

Recommendation:
The Site should be assessed for surface and radioactivity hazards to determine if surface reclamation has been effective in the long-term elimination of such threats to human health and the environment. Additionally, the capping of shafts and boreholes should be evaluated to determine their long-term effectiveness toward preventing potential contaminant migration to ground water. NMED also recommends assessment of sediments in the Site vicinity in order to evaluate the potential occurrence of impacts from dispersal of waste materials that have been left on-Site.

Currently, the existence of regional impacts from legacy uranium sites to the ground water system has not been determined. Ground water was pumped from the Sandstone mine in order to access the ore deposits, but the final disposition of the discharged effluent is not known. A generalized investigation of

potential alluvial ground water impacts from "wet" former uranium mines within the Grants Mineral Belt is recommended as part of regional ground water quality characterization. If this generalized investigation were to indicate a potential for alluvial ground water impacts, on-site installation of one or more monitor wells then should be considered.

Data from other former "wet" mines suggest that repressurization of the ore-host Morrison Formation, following cessation of pumping for mine dewatering, may be causing mobilization of uranium and associated minerals, and consequent degradation of ground water quality, due to influx of oxygenated ground water. The potential for such impacts, on both regional and site-specific scales, should also be assessed and characterized.

References:

1. United Nuclear Corporation, August 26, 1994, Request for Inspection of Certain Reclaimed Existing Mining Operation, Letter from UNC to NMEMNRD.
2. NMEMNRD, May 25, 1999, Determination of Release of Prior Reclamation Sites, Ann Lee, John Bill, and Sandstone, Letter from NMEMNRD to UNC.
3. New Mexico Energy, Minerals and Natural Resources Department, 2007, Abandoned and inactive uranium mines in New Mexico database, Mining and Minerals Division.
4. McLemore, Virginia T. and William Chenoweth, revised 1991, Uranium mines and deposits in the Grants district, Cibola and McKinley Counties, New Mexico. New Mexico Bureau of Mines and Mineral Resources Open-file report 353.
5. Goad, Maxine S. et al, July 1980, Water Quality Data for Discharges from Uranium Mines and Mills in New Mexico, New Mexico Health and Environment Department, Environmental Improvement Division, Water Pollution Control Bureau.
6. Brod, Robert C., 1979, Hydrogeology and Water Resources of the Ambrosia Lake-San mateo Area McKinley and Valencia Counties New Mexico, New Mexico Institute of Mining and Technology.
7. Environmental Protection Agency, September 1975, Impacts of Uranium Mining and Milling on Surface and Potable Wters in the Grant Mineral Belt, New Mexico, Office of Enforcement, Denver, Colorado.
8. New Mexico Office of the State Engineer, 2011, New Mexico water rights reporting system database, point of diversion by location, four mile radius of the Sandstone Mine.
9. United Nuclear Corporation, June 29, 1994, Updated New Mexico Mining Act Owner/Operator Information, Letter from UNC to NMEMNRD.

Table 1. Domestic Wells within a Four Mile Radius of the Sandstone Mine, New Mexico Office of the State Engineer.

OSE Well Number	Well Use	Well Owner	Section	Town-ship	Range	Depth of Well	Depth to Water	Water Column
Wells (>2 and <3 miles)								
B 01190	Livestock[a]	(b) (6)	11	13N	09W	390	37	353
B 00456	Livestock[a]	(b) (6)	14	13N	09W	700	*	*
Wells (>3 and <4 miles)								
B 01104	Domestic	(b) (6)	14	13N	09W	303	247	56
B 01115	Domestic	(b) (6)	15	13N	09W	478	204	274
B 01636	Domestic	(b) (6)	22	13N	09W	260	80	180
B 01544	Domestic	(b) (6)	18	13N	08W	715	624	91
B 00659	Domestic	(b) (6)	22	13N	09W	220	190	30
B 00390	Irrigation[a]	FERNANDEZ CO. LTD	18	13N	08W	1800	900	900

* = Value Unknown

[a] = Wells are permitted for household use

Table 2. Domestic Wells Sampled within a Four Mile Radius of the Sandstone Mine

OSE Well Number	Well Use	Well Owner	Gross Alpha	Radium 226/228	Uranium	Selenium
			pCi/L		µg/L	
B 01104	Domestic	(b) (6)	**16.0**	0.51	20.6	13.2
B 01115	Domestic	(b) (6)	**46.6**	0.96	**63.9**	**73.6**
B 01636	Domestic	(b) (6)	**20.7**	0.33	13.8	**66.2**
B 00659	Domestic	(b) (6)	6.2	1.39	10.1	27.1
*	Domestic	(b) (6) -1	**56.0**	6.81	2.0	2.0
*	Domestic	(b) (6) -6	0.9	0.72	2.5	2

* = Well not permitted with the OSE

Bold = Exceeds the EPA MCL and or NMWQCC Ground Water Standard.

pCi/L = picoCuries/Liter

µg/L = micrograms/Liter

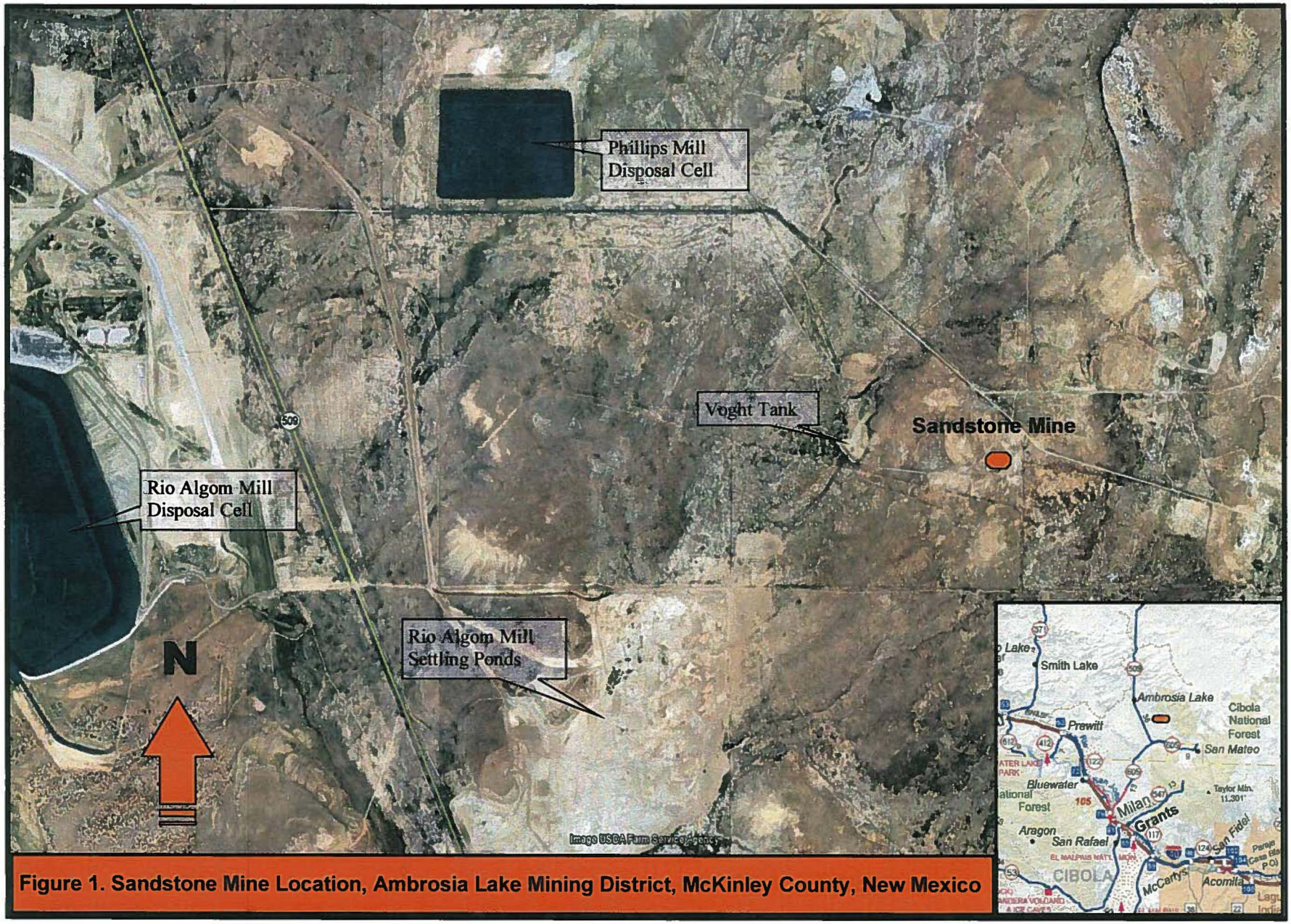

Figure 1. Sandstone Mine Location, Ambrosia Lake Mining District, McKinley County, New Mexico